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Vo. 4 FEBRUARY, 1923 No. 2

Preservation of Soil Fertility An Engineering Problem

By C. C. Hermann
Mem. A.S.A.E. Chief Engineer, The Litchfield Manufacturing Co.

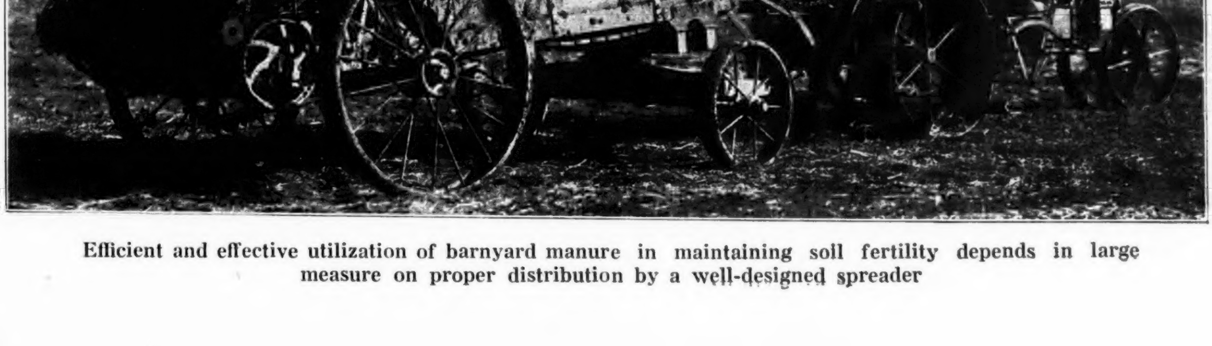
A SUBJECT that merits the close study of agricultural engineers is the preservation of soil fertility. The average carelessness on the part of the farmer in not returning to the soil amount of fertility equal to that removed is well known. Manure piles unproteced, organic and animal matter not utilized, and the fertility of the soil allowed to wash away are points of common knowledge.

When our soils were new or virgin prairie, the fertility dominant, and called upon to produce nothing more than wild grass for the buffalo, there was little need of additional fertilization. Our forefathers found the soil full of energy and fertility and were able to produce without great effort. The years of constant production, however, have drawn heavily upon its stores of energy and we now find the productive capacity of this same soil impaired. To many our farm lands may seem capable of supplying the needs of many generations to come. Such contention is not borne out by facts. Unfortunately our farm land area cannot be appreciably increased. True many lakes and swamps can and will be drained, many desert places will be supplied the necessary moisture, however, can such reclamation keep pace with the increase in population? No, but it may not be proven in practice for many years to come.

There is but one solution to the problem and that is increased production, to keep pace with the increase in population, by returning to the soil each year fertilization equal in amount to that removed by the crops produced. This nation can prosper and future generations survive only by the practical application of this policy. The responsibility ultimately rests with the farmer, but the agricultural engineer must share the responsibility with him . It is the function of the engineer to guide and direct this work of reclamation and to provide the essential methods and tools for successfully carrying out the work.

The soil has a potential power far beyond man's fondest expectations. Forces heretofore unknown and unseen are contained in the soil, and these will no doubt in time become playthings in the hand of the farmer by virtue of scientific research and application of known principles effecting fertilization.

It is at once apparent to the most casual observer that the fertility of our soil must be restored from time to time. The question at once presents itself—How can we prevent a continued depreciation of plant food in the seedbed? It is common knowledge that one of the essential plant food elements is oxygen obtained from the air in unlimited quantities through proper drainage and tillage of the soil. Also that nitrogen which forms 77 per cent of the entire atmosphere is an essential element to plant life. We also know that legumes possess the power to remove nitrogen from the atmosphere and deposit it in the soil, and that carbon is obtained from carbon dioxide which is the product of decomposed animal and vegtable matter and that it is necessary for the sustenance of plant life. Such elements as sulphur, iron, lime, potash, etc., are obtained from small particles of rock deposited by nature and disintegrated.



Efficient and effective utilization of barnyard manure in maintaining soil fertility depends in large measure on proper distribution by a well-designed spreader

Phosphorus through some unknown agency has been abundantly distributed throughout the soil and subsoils of our agricultural region.

Aside from placing these elements in our tillable soil, nature has deposited at various places abundant supplies of these same elements, as it were, to meet an emergency. Vast beds of limestone, potash, and phosphate rock are available in almost inexhaustable beds. Leaves and bark from trees and decayed vegetable matter found in our swamps and forests are rich in plant food. Excreta from human beings and animals devouring the food thus produced also forms a supply of plant food. In these excrements fully 75 per cent of the food elements required in plant life may be returned to the soil.

It is the function of the agricultural engineer to make this vast store of plant food available on an economic scale. The farmer once realizing the absolute necessity of returning to the soil this plant food is naturally interested in doing so at the least possible cost. In the distribution of barnyard manure we are conversant with three distinct methods: (1) hauling the material to the field in an ordinary farm wagon and scattering with a fork; (2) hauling in an ordinary farm wagon unloading in piles and later distributing with a fork; and (3) hauling by means of an up-to-date spreader and distributing the manure mechanically. Of the three methods, the latter is by far the most efficient and effective method. The spreader that will give an even distribution and complete disintegration of the material is conceded greatly to surpass the hand-fork method in cost of distribution per ton and effectiveness of fertilization. Whereas it requires from twenty to thirty minutes to distribute a ton of manure by the handfork method, the same quantity may be ditributed by a spreader in from three to four minutes.

The superiority of the mechanical spreader over the handfork method of distribution has been amply proved. This being the case concentrated thought naturally turns to the development of a spreader that will distribute efficiently with the least expenditure of power. The spreader is a machine of composite design requiring the application and transmission of force—(1) a horizontal motion necessitating draft; (2) rotary motion, and (3) again a horizontal motion. This transmission may be accomplished by one of many ways; however, the initial motion is more generally by the application of drawbar power. The future may develop a self-propelled manure spreader; however, today we are concerned with such machines as may be drawn by horses or a tractor. In either case the draft is augmented by the necessity of generating sufficient power at the periphery of the traction wheels to drive the disintegrating cylinder, the broadcaster, and the apron.

The drawbar pull required of course depends on a number of factors such as conditions of the soil, topography of the field, weight of load, lubrication of the bearings, the design of the transmission, and varies within wide limits. A sixty-bushel machine should under average field conditions be well within the two-horse capacity. Present types of spreaders follow along well-defined lines of design with regard to running gear and body, the great variance being found in the method employed in the feeding mechanism and disintegration. A spreader to be successful must be more than simply an unloader. It must disintegrate the material instead of throwing it out in great bunches. It must spread evenly rather than heavy in the center. It must possess a latitude of feed capable of top dressing a fine pasture to depositing as high as 1000 bushels per acre. It must produce a true drawbar-pull curve, namely a curve which gradually tapers off as the load is distributed rather than one where the drawbar pull increases from the start up to the time that half of the load has been distributed before tapering off due to the material wedging between the sides. An average draft team can exert fully two-thirds its weight in drawbar pull for a short time, and it is therefore essential for maximum efficiency to obtain a gradual reduction in the drawbar pull as the load goes off.

The disintegrating cylinder must have sufficient teeth to do its work effectively; they must be properly spaced, and the peripheral speed must be sufficient to clear the material if winding is to be avoided. Much research work is yet to be accomplished in the way of determining the proper peripheral speed of the beaters, and their diameters and relation to each other and the load. Much has been accomplished in this regard, but the subject is far from a closed book as yet. A beater wheel that may prove successful in one class of material may be a dismal failure in another; therefore, the law of averages must obtain.

It is questionable whether or not the benefits derived from the use of a broadcaster warrants the expenditure of energy required in its propulsion. With the development of a more accurate feed control the use of a broadcaster may be eliminated. Its use is mostly confined to top dressing with machines on which the feed cannot be reduced to the extent required.

Feeding mechanisms add greatly to the drawbar effort required; however, this has been greatly diminished by the introduction of the direct or cantilever feed operating from a cam on the rear axle of the more recent type of machines. One point characteristic of most machines on the market today is that the load compresses between the spreader sides as it is moved rearward thus adding to the draft. Some manufacturers have attempted to correct this by a gradual widening of the box toward the rear. Prominent among these and the most successful is the expansion chamber method of relieving this pressure. The expansion chamber consists of a foreshortened side panel twelve to fourteen inches ahead of the beater. The chamber is provided with sides spaced out beyond the regular spreader sides allowing the material to expand just ahead of the disintegrating cylinder. Here again is a field for scientific research and development. Much remains to be accomplished that will no doubt result in reducing the power necessary at this point.

The transmission employed in a manure spreader necessitates numerous moving points and bearing surfaces, many of which must be exposed to sand and grit contained in the material handled as well as that carried up by the traction wheels. These bearings must be of sufficient size and amply protected and at the same time have the means of lubrication well exposed to the view of the operator. Under most favorable conditions the wearing surfaces are often neglected and add to the draft for want of proper lubrication and attendance. Lubrication of this type of machinery must necessarily depend on the human equation, positive and automatic lubrication being practically out of the question if not from the standpoint of design at least from the standpoint of manufacturing costs. Simple yet positive lubrication system for farm machinery is a field of design in which merely the surface has been scratched.

Equalization of draft is another phase of the industry that offers much space for development particularly in connection with three-horse requirements. The conventional set-over pole for use where three horses are worked abreast is subject to criticism due to its cost to obtain the necessary strength to work satisfactorily. Late designs of three-horse equalizers for use on straight-pole machines, although an advance in the right direction, still possess the characteristic of crowding the pole to offset the side draft. It is not only possible but probable that the hitching point for the three-horse equalizer will be located elsewhere than on the pole on future machines.

The Problem of Electrical Energy Use on the Farm

By J. C. Martin
Western Editor, "Electrical World," representing the Rural Lines Committee of the National Electric Light Association

THE past three or four years have witnessed a rather remarkable development particularly in the central station field. It has been that of the consumer seeking the seller and demanding that he be given something that the seller finds it almost impossible to sell even though that something is his stock in trade. The consumer in the case has been the farmer, and the seller the central station. The farmer, seeing the comfort and convenience of electrical energy in urban life and sensing the possibilities that it may offer from an economic standpoint in his activities as an industrial concern, has been unable in many cases, to understand why an electrical power supply cannot be readily taken to his door as it has been to that of the city man. He has made attempts, with more or less success, to get his own power supply by building lines to the central station system and buying power on a wholesale basis, doing his own distributing and thereby in many cases entering, legally at least, into the utility business and assuming, without realizing it, responsibilities that have later proven a severe burden. All sorts of errors, some ludicrous and some tragic, have been committed in such projects. On the other hand, the central station man backed by a quarter of a century of established business practices has been unable to find a way to meet the demand for service that would place it on the familiar ground of established practice. He has committed just as many blunders of a different kind in his efforts to solve the problem or in some cases to avoid meeting it at all. Commissions have been brought face to face with the problem and found it a knotty one to solve. Several attempts have been made to provide a basis of practice that will be fair to both the consumer and the seller. Some success has been attained, but it is not of the character that indicates the lines along which practice will finally stabilize. After four or five years of work on the problem, both the seller and the consumer are still groping very much in the dark and the solution seems as far off as ever.

As a matter of fact, I believe that the difficulty lies largely in the old, old human failing of refusing to look a problem over and analyze it to see what is involved. It seems to be the history of almost every development of any character that is worth while in human affairs, that it takes a certain amount of aimless floundering before the issues involved become clear. I believe that this floundering is just what has occurred in this particular field in the past few years and that the time has come when we must all look at the problem squarely and find out what it is all about.

In attempting to touch on a few of the high spots as they appear to me, I shall probably talk largely from the central station viewpoint. I want to make it clear that this is merely to emphasize as strongly as possible, the features of the problem that seem to need the greatest attention. I do not believe the central station has the slightest chance to absorb all the business in the agricultural field. The individual farm lighting plant has had a wonderful development and I believe is destined to fill a field that the central station cannot touch. There are and will be many places where the central station can supply a service that the individual lighting plant cannot touch. The two kinds of service must supplement each other, and, as a matter of fact, work hand in hand to give the farmer the service that I am personally convinced he needs.

*Sixteenth Annual Meeting Paper.

Two facts are thoroughly proven in economic experience. One is that the seller must make a profit if he is to continue in the business of selling a product. The other is that the buyer must make a profit from the use of the thing he buys. In the case of the buyer the profit does not always come in the form of a money balance. It may come in the form of better living conditions, better health or in numerous other forms. However, if he is using the things he buys in a producing business from which he secures an income to support him, then he must be able to turn those things into more cash than he pays for them, including the labor and process costs through which he must put his raw materials.

Two questions present themselves in this problem. To dispose first of the one which seems to be simplest the sellers problem will be discussed briefly. The central station man called upon to give service anywhere has certain total cost limits below which he cannot go in establishing the service. The costs per consumer are controlled in certain items by the number of consumers he can serve with a given amount of material in the form of service plant. In certain other items the cost is independent of the number of consumers. When called upon to build a city line he can figure eventually on from approximately twenty to one hundred consumers per mile of line. Probably the general average is around fifty per mile or slightly less. Called upon to serve the same class of consumers in rural territory he cannot expect, in the Middle West and West, more than three per mile, and the general average in service so far established is less. The expense per consumer that is affected most by the number of consumers served by a given line is the biggest expense. When he has figured out the entire problem, he finds that for a line costing a given sum in city service he will serve, say, forty to fifty consumers, and in the country a line costing approximately one half the amount will serve only about three consumers. This is because there is a minimum amount of material that can be used in building a line that will stand up under the climatic and other physical conditions it must meet. This amount of material as you will readily understand has no relation to the number of consumers. It must be used to secure physical strength. He also has to face the fact that in maintaining his rural lines he must arrange to travel miles for service and maintenance purposes where in his city or town service the travel is measured in blocks. Good pavements in city work and poor roads in many country districts serve to widen the difference in expense. The difference in expense is inherent in the method of giving service and unfortunately it is the only method we know. So far as existing information in the engineering field goes there are no developments in sight that can change the situation materially through better efficiency and therefore some lowering of cost can be looked for as the mileage of rural distribution lines increase. This situation is the heart of the central station side of the problem, and is a stone wall over which it is impossible to climb and place the individual farmer from a service cost standpoint on the same basis as the dweller in more closely settled districts.

The user's problem is divided into two parts. As was noted a moment ago the buyer must distinguish between the uses to which he puts the things he buys. We have heard a great deal of the need of improving farm living conditions in the past few years. Much of this has had to do with the

farm home. If he can make the other part of his activities pay him a fair return on his investment the farmer can afford to spend money on improvements in living conditions in the home. In fact he is doing this in many directions. In the electrical energy use problem the question is how can he make electrical energy relieve the home condition. The way to the solution of this problem is well paved by the developments in city homes, so far as light, the sewing machine, the washing and ironing machine, and the ordinary items of home use are concerned. I am not so certain that this is true of such items of equipment as the electric range and the refrigerator. The man in the city has had a cheap gas supply at his door for years. While the electric range offers many advantages over the gas range, the fact remains that the gas range has been the means of eliminating the kitchen drudgery and discomfort that is inseparable from the wood or coal range. This means of escape for the farmer is barred by the economic cost of getting such service. Merely placing the electric range in the farm kitchen will not solve the problem. On the contrary, it may make it worse. Like every new piece of equipment the electric range requires a large amount of educational work before it can be used properly. It upsets to a considerable extent the habit of years on the part of the housewife who has been accustomed to the quick, hot and inefficient fire in the coal or wood range, and to use it economically requires a good deal of education and adjustment in the form of experience. The farm housewife is in no different position than the city housewife when it comes to this sort of educational work. In the matter of the use of electrical appliances a good many years have been put on the education of the city housewife, and she is not fully educated yet.

In the matter of ice the city man has had an ice supply at his door for years. The farmer has not had this service except at the cost of a great deal of labor on his part, and because of the situation he is in probably cannot get it at a reasonable cost from other sources than his own labor at any time in the future. The refrigerator operated electrically is not as fully developed as many other kinds of electrical apparatus but it has reached a state of where its future is assured as a successful and commercial piece of equipment. Just what these two items of electrical equipment offer to the farm home is a matter for the future to decide. That they have great possibilities is certain and a considerable amount of study can be devoted to their use on the farm.

The other and by far the biggest possibilities, however, lie in the field of farm work that corresponds to the business activities of the city business or industrial man. It seems that the time has come when the farmer must view his farm producing problems in exactly the same light as the factory owner or executive views his production problems. In other words, the farm as a producing agency is a factory, with its production, marketing, and sales problems. The farmer has his power problem. For centuries that power has been human or animal because it has been cheap. In America cheapness is no longer a certain feature of human labor unaided by machinery. I think it is fair to question whether animal labor is not reaching the point in many directions. I understand from farm sources that it requires the products from several acres of ground each year to sustain a single horse used in farm work. If by means of machine equipment the products of that ground can be turned to other uses, what is the gain to the farmer? If it is possible to increase the production per man from this acreage and the remaining acreage now devoted to other purposes, what is the value of such a gain to the farmer. If it is possible for example to reduce the number of horses used on a 600-acre farm to two, as one English investigator claimed recently, by the use of some form of power other than animal, what is such a gain worth to the farmer in the solution of his production-cost problems. If some form of power can take over many of the tasks around the farm yard that have required hired help or the constant time of the farmer, what is such a transformation worth in dollars and cents to the farmer, viewing his establishment as a factory? In a recent discussion it was pointed out that forced curing of hay had been resorted to in an experimental way in England and the results seemed to show that the food qualities of the product are better than that cured in the ordinary way. The discussion brought out the difficulties experienced in the handling of alfalfa in certain parts of the United States. It was asserted that a certain portion of each yearly crop is lost due to inability to cure the hay properly and that food values of an entire crop may be seriously depreciated. The process used in England is merely that of forcing air through the green hay which has been stacked or mowed immediately on cutting. The process is simple and outside of an ordinary fan and motor the only equipment involved was some sort of a tunnel under the stack into which the air is forced and then allowed to escape through the green hay carrying the moisture with it and curing the hay before destructive processes can set in. The discussion developed the fact that there are other crops on which the same process might make for an improvement in product, both from a marketing and feeding standpoint. Of what real value is such a process to the farmer?

The question of water supply both from a sanitary and stock production standpoint and also that of crop production is an important one in the scheme of farm work. Some forms of mechanical power have gone a long distance in the solution of the farm water supply problem. Electrical equipments now on the market have gone still farther. What is the real value of the water supply and how far should the farmer go from an economic standpoint in providing a water supply and to what extent can he use the mechanical and electrical means that may be developed?

The farmer has a haulage problem that is bigger than most of us realize. The gasoline motor truck is playing a big part in the solution of that problem. In city work the electric truck is playing an important part in the solution of the city haulage problem of a certain type as against both the horse and the gasoline motor truck. Whether the electric truck can play any part in the farm haulage problem I will not venture to predict. All that can be said now is that it should at least receive consideration.

A good many things in the foregoing have been put in the form of questions. This is because no one knows the answers. One thing is certain. The farmer will not use electrical energy in the solution of his production problems unless he can use it at a profit. As matters now stand much of his equipment is designed for the use of horse or human power. This statement does not decry the fact that a great deal of work has been done in the development of proper mechanical equipment. So far the development hardly appears to have scratched the surface. Many, including men in both the agricultural and electrical fields, believe that the future development of farm equipment must follow in a general way the broad lines of progress that have been followed in the industral field in the past twenty-five years, namely the development of equipment of the highest possible mechanical efficiency, which requires the least human labor to keep in operation and which places the production possibilities on a plane that hand labor can never approach. In the industrial problem electrical energy twenty-five years ago was a doubtful factor. Many yet in the electrical industry remember when the connecting of an electrical motor load was an event the results of which were watched with fear and trembling. Today electrical energy is an indispensable factor in the modern factory. To reach that posi-

tion an enormous amount of research and development work has been done. Some of it has involved purely electrical matters. The largest part of it has probably been concerned with industrial processes and machine equipment and their modification to take the greatest possible advantage of the latent possibilities of electrical energy. The task has not been an easy one.

I believe that much the same road must be traversed in the development of electrical energy use on the farm. If it is to be used profitably there will probably be as great a modification on farm processes and equipment as has taken place in the industrial field with the advantage that the lessons learned in the industrial field have a bearing on the farm problem and the later development can start on a much firmer foundation if the proper care is taken. But finely built and adjusted machines cannot be put in the hands of the farmer and successfully used and maintained without a material modification or one might say revoluution of the present situation.

How can the problem be solved? It is not an electrical problem. It is not an agricultural problem. It is an economic problem that involves both electrical and agricultural problems. The economic problem will not be solved by the electrical industry working independently nor by the agricultural industry. It must be solved by both working in harmony in order that the viewpoints of both may be properly considered. Involved in it will be a vast amount of research work that will be electrical in part, and much of it will be purely agricultural. In this research work the agricultural engineers must play a large part. The extensive research and experiment stations of the United States in which you are so deeply interested have the facilities to undertake the work, and I hope that this paper will help to crystallize the problem of electrical energy use on the farm in your minds and assist in bringing about thinking aimed at a determination of how the farmer can utilize electrical energy at a profit in his production problems. The real problem in reducing the cost of energy is to get an increase in use which will absorb the costs of getting the service and still leave the farmer with a profit as the result of his expenditure. That this can be done I have no doubt, since the problem is no more complicated than many another problem of energy use which has been successfully solved. I am sure the electrical industry will lend the best of it's brains in the work, but I know that the thinking of the agencies trained in the solution of farm problems must be brought to bear also. It takes many types of minds and thinking to bring out all the angles that must be met and finally solved. We need all of them from both industries.

Farmstead Arrangement*

By O. L. Polk

Student Mem. A.S.A.E. University of Nebraska

THE importance of farmstead arrangement in the farming business is not usually felt. Farming is a business just as the manufacture of automobiles, or any other industry is a business. It depends upon economic management.

With this in mind I shall give you a few of the important things that effect the arrangement of the ordinary farmstead. To begin with let us consider an ideal case in which a farmer owns a piece of land and is about to erect a permanent farmstead on it, for himself, his boy or for rental purposes as the case might be. You realize that this is ideal because nothing has been done; no site will have to be changed and buildings moved. It is a clear field for the agricultural engineer. If the lay of the land is not known this should first be done, so as to locate properly the farmstead with respect to external influences, such as accessibility to fields, drainage, prevailing winds, water supply and the nature of the soil.

Although long lanes are usually considered an economic loss, it is very often advisable to put the farmstead in the center of the farm and connect it to the road by means of a lane. This places it approximately equidistant from all the fields and from the highway itself. The second thing to consider is the drainage. It is imperative that the land slope from the house to the barn, and where it is possible from the well toward the house, at least the well should be higher than the barn or barn lot. If the prevailing winds are from the north as we have them in this section of the country, in the winter it would not at all be a bad plan to place the farmstead on a south slope thus affording as much protection from the weather as nature provides. The water supply probably ranks as the first consideration in the preliminary plans. A good well is one of the most valuable assets a farmer can have. It is the basis of sanitation for himself and the livestock on the farm.

This then, in a general way, are the things to be considered in locating the farmstead with respect to the rest of the farm. It is quite another problem to locate and arrange the buildings with respect to each other after the site has been chosen. The foremost consideration, I believe, is convenience—convenience in doing chores, convenience for the stock, and convenience for all the daily farm operations. It is estimated that the average farmer walks in the neighborhood of 300 miles a year in the simple operation of doing the morning chores.

The location of the farm dwelling is the key to the whole layout and should therefore receive first consideration. It should be placed on the high ground and as close to the well as possible. If the prevailing winds in the summer time are from the south or southeast, it is well to locate the stock barns, stock shed and lots to the north, northwest or northeast of the dwelling, so as to carry off all offensive odors that might arise from this source. The barn should be in the neighborhood of 150 feet from the house. This cuts the distance down to a minimum and at the same time fire is not apt to travel from one building to another. All open sheds adjacent to the barn should open either to the south or east. The corncrib, granary and implement sheds should be accessible from the mainway but more important should be close to the road leading to the fields. The hog lot should adjoin the cattle yard so as to facilitate the common practice of letting the hogs follow the cattle.

As was stated before these considerations are in lieu of ideal conditions, and while it is absolutely essential that we have in mind ideal conditions from which to base and construct our plans, it is very seldom that they are encountered. More often the farmstead site has already been established and a few buildings erected. The agricultural engineer is asked to solve the problem of making this layout an efficiently arranged farmstead.

*Paper presented at a meeting of the A.S.A.E. Student Branch at the University of Nebraska.

How to make the Farm House a Home*

By Joanna M. Hansen

Professor in Charge of Art Department, House Economics Division, Iowa State College

WHAT can be a more delightful task than to make a new farm house into a home. If an engineer has supervised the structure one may be quite certain that it rests upon firm foundations and that it is good structurally. If he is also an architect and a landscape gardener besides being an agricultural engineer, one is assured that the plan will meet the required conditions of country life. With a convenient plan, an attractive exterior that is permanent in character, and well-landscaped grounds, the enthusiasm for the exterior is certain to carry over into the interior of the home.

If, on the other hand, the home is an old one, it may be necessary to stretch the imagination a great deal in order to see the final result desired. More obstacles will need to be overcome, but what a joy it is to take something that at first seems to lack possibilities, and then, through the exercise of brain and hand, and the application of art principles, eventually to achieve success. Proportion, balance, subordination, rhythm, harmony and unity need to be applied to the farm home and its interior. It is worth months of planning and days of doing if the result is simple, convenient, homelike, comfortable, colorful, and beautiful.

One frequently hears this remark: "I expect to live on this farm but for a short period only, hence I am expending but little time and effort in beautifying my surroundings; I don't enjoy rented farm houses anyway. There is always something wrong and the walls, woodwork, and floors are usually impossible." Great sympathy is due to the tenant who moves about, but attractive surroundings are as necessary to complete living as are food and clothing. With but little expenditure, and the exercise of good taste, most farm houses may be made livable and comfortable, and may be made to have some elements of comfort and beauty.

The country school house next to the home is the most important institution in country life.

The average rural school just as the average rural home lacks beauty both externally and internally. The grounds are frequently bare, with no vines, shrubs, lawn or trees to soften the lines of the buildings. Through the extension service of the state agricultural colleges help might be secured in landscaping the grounds. Arbor Day should be observed in beautifying the grounds by appropriate planting.

The interior of the school is frequently so ugly and utterly devoid of beauty that it may undermine the influence of good surroundings in the home, while it should be a constant object lesson in cleanliness, neatness and beauty. It is to be hoped that the school in your community is just the opposite of the one answering to this description: A rusty stove with a long range of unstable and unblocked stovepipes; walls and ceiling soiled and cracked, with but enough paper or paint in evidence to show that years ago they had been fresh and clean; bits of colored paper or Christmas decoration as reminders of entertainments of the past; ugly chromos or calendars on the walls; floors worn and soiled and blackboards long past usefulness. Such school rooms still exist, but they employ just the kind of untrained teachers that you would expect in such surroundings.

Picture in contrast the ideal school room: A stove well blacked hidden by screens when not in use; immaculate walls of cream and a ceiling of lighter value; a bulletin board with well-placed drawings and school work of the current week, not displayed for show but for inspiration and encouragement; a fine picture or two in color, appropriate in subject well framed and well hung; floors clean; blackboard well kept; a table or bookcase with current magazines and a few well-chosen books; a well-selected library, and handicraft work suitable to the various ages—all these things will add much to the joy and development of the school. The most important of all, however, is a well-trained, progressive teacher attractively and neatly dressed, one who loves her work and who loves and understands children. A few big boys and girls under the direction of such a teacher, who also understands how to select and apply paint, might perform a miracle on the walls and furniture of the ugly and unattractive school room first described. Some of the consolidated schools are a source of pride to many communities, and so may be the one room school houses.

The appearance of the school should indicate the type of homes from which the children come.

If all people owned their own homes more beauty might be expected in both the exteriors and interiors. It will be assumed that the owners are equipping and furnishing their own homes since one needs to start from the ground up and to go from the exterior to the interior to be assured of success.

The farm site and home should indicate to the passerby the personality of those who dwell within the walls of the home. It is possible for the traveler on the road, or for the casual visitor to the farm, to read many of the chief characteristics of the farmer and his family from the appearance of the farm site. Thrift, power of organization, order, cleanliness, progressiveness, efficiency, and the love of beauty may or may not be seen according to the personality of the owner, his wife and children.

Each member of the family may do something to add to the appearance of the whole. "Order is heaven's first law," and a first requisite of beauty. This may be secured by keeping the porches, dooryard, and barnyard clean and neat: the machinery well painted and protected; the fences and buildings in good repair. Other things being equal, an orderly, well-kept farm will appear of greater value than one which is neglected and disorderly in appearance. Good order and cleanliness have actual value in dollars and cents.

A well-graded and trimly kept lawn that is not cut up by small flower beds will add much to the charm of a home. The house as well as the barns should be pleasing in proportion and fine in line. Too many roof lines, gables and porches detract from the simplicity of the design, and simplicity is necessary to beauty. Good window spacing, an inviting doorway and entrance, a well-placed and well-proportioned porch, will assist in securing a fine adjustment of spaces and parts.

The farm house and not the barns should be the center of interest on the farmsight, and the center of farm activities. As such it should be convenient to the service yard which should be so planned that easy access may be had to the public highway, garden, orchard, and to all the buildings and fields of the farm. The house should be placed far enough from the public road to secure privacy. A pleasing approach through an avenue of trees and well-landscaped grounds will add much to its attractiveness. A background

*Sixteenth annual meeting paper.

of trees is of equal importance, since a proper setting lends great beauty. Poplars, which grow rapidly, may be set out with slower growing and more permanent trees. Poplars are very decorative as backgrounds, as avenues of approach, and as screens to hide buildings of an undesirable view. Shrubs are desirable for use in softening the foundations and corners of a house. They are, if effectively grouped so that the eye is lead gradually from the drive to the house, better than flowers or perennials which bloom but a short time. Round or rectangular flower beds break up the lawn and are very ugly when outlined with stones or shells. Flowers usually look best against a background formed by a wall, hedge or fence, in a flower garden or in nature's haunts.

Granted that the surroundings of the home are beautiful, the effect of the whole may be out of harmony if suitable color is not chosen for the house and other buildings.

Good paint not only preserves the buildings, but if properly selected and applied, adds a great deal of beauty. The barns and other outbuildings will appear in better color harmony if some color more inconspicuous than red is used. Red is somewhat cheaper but that alone does not warrant its wide use.

The house as the center of interest in the farm sight may be lighter in color than that of the outbuildings, and may have stronger color contrasts. White with a trim of gray or olive or apple green looks well with trees and lawn. Light colors such as French gray, light tan, buff, or cream are good, and dark colors such as green and grayed brown or a combination of values of one color are inconspicuous. The outbuildings may be the same color as that of the house if white is not used, but the trim should be near in value and color to the main colors used for the buildings so as not to attract undue attention. Buildings not pleasing in proportion or line are less obtrusive if painted in dark grayed colors such as dark greens and woodsy browns.

There are certain art principles previously mentioned which need to be applied to country life if it is to be made as efficient, as ideal and as beautiful as possible.

Art began with the useful arts. What a vast improvement there has been from the first digging stick to the fine plow of today! Primitive farm tools have been improved, and have developed into modern tools of remarkable efficiency. The well-to-do, up-to-date farmer not only uses this fine machinery but has a knowledge of the best methods of agriculture as well. Drudgery has to a great degree been eliminated from the labor of the fields. It should likewise be eliminated from the work of the home. Long after many a farmer is prosperous, and has a quarter-section of fertile and improved land, large barns, fine herds, a silo, a tractor, an automobile, and almost every modern farm improvement, his wife has not even running water in her kitchen and but little hope of having a bathroom, a furnace, a good lighting system, a washing machine run by motor power, and other labor-saving devices. Picture her standing over a hot cook stove in summer; carrying water for washing, bathing, and cooking, and walking miles a day in a poorly planned kitchen with no modern equipment. She can not under these circumstances be any more efficient than could her husband had he not provided himself with modern labor-saving machinery. Of a certainty a woman lacks spirit if she does not insist upon having running water, good bathing facilities, and sufficient conveniences to make it possible for her to bring up her family properly. The health, the mental and moral development, and the happiness of the family depend upon the wise planning and the efficiency of the mother. If her life is one of drudgery, how can she plan, prepare and properly balance the meals that are necessary three times a day? How can her children be as strong as they should be without bathing facilities; how can she have leisure to be of assistance to them in their school work, to see that they form the habit of reading good books, and take an interest in things worth while: how can she make the house a home and surround the children with proper influences and an attractive and suitable environment if she must spend most of her time in the kitchen, the chicken yards, and the milk house? Her husband is shirking his responsibility and is not a real American if he does not insist that she and his children have a vital share in his prosperity. The health and education of children are more important than hog and corn raising, notwithstanding the importance of the latter. Although almost every farmer in Iowa has an automobile, but fourteen per cent have bathrooms. In Minnesota but seven per cent have bathrooms, and in many other states the owners do not know how to use those they do have. They can hardly wait until Saturday night comes round! The need of more frequent bathing as a requisite to health needs to be stressed in the great health campaign which is to be carried on in many states the coming year.

At first, to be sure, it is necessary to place the farm on a paying basis, and during this period it is no doubt possible to put up with inconveniences and makeshifts; but when the farm pays, the home and the family should come in for their just share of consideration. With better equipped homes the farmer, his wife and children may have more time to devote in improving and beautifying the farm sight and the farm home, both within and without. More leisure may also

A READING of Miss Hansen's paper, "How to Make the Farm House a Home," should make it clear to an agricultural engineer that this is as much an engineering problem as planning and equipping a dairy barn or a hog house, except that in the home the elements of beauty and harmony are major factors, in which the women naturally excel. The home is fundamentally the most important part of farm life, and to raise the standard of home life on American farms requires the best efforts of agricultural engineers of both sexes

be secured for reading, study, community needs, and for social times. An alarmingly large per cent of farm boys and girls are leaving the farm for work in the city. How may this percentage be diminished? Although there are various factors that enter into this problem, there are many ways in which farm life may be made more attractive. Conveniences and privacy appeal to every normal person. The drudgery needs to be eliminated from the farm home. The daughter, after a visit to the home of some city friend who has an attractive room of her own and one that is warm in winter, will miss this privacy when it is necessary for her to sit in the kitchen with all the members of her family and the hired help about, while studying, reading, or entertaining her friends. Teachers in the country schools complain most of the impossibility of securing a boarding place where they may have a warm room so that it is necessary for them to remain evenings with the family and help in the kitchen or living room. In the construction of a new farm home planned for a hill sight, it is possible not only to plan for storage, furnace, and various needs in the basement, but shower baths, a wash room, and a living room for help may be planned, if sufficient sunlight and air are available, and if there is not a separate house for the help.

Not only should the home minister to the physical needs of the individual, but it should also minister to the mental, moral and beauty-loving side of each one as well.

Simplicity is a first requirement. As Ruskin says, "Have nothing in your homes that you do not know to be useful or believe to be beautiful." Plain spaces are necessary to enhance the value of the decorated portions, whether of an exterior, a gown, or a room. Millions of dollars are annually expended for trifles and nick-nacks which are not only useless, but dust catchers as well. A well-furnished room never has the appearance of being crowded with furniture or with little objects. An unrestful effect is obtained by a multiplicity of objects.

The floor, walls and woodwork or trim form a background for the furnishings and the individuals in the room and should be unobtrusive and inconspicuous. Many mistakes are made in the selection of wall coverings and rugs. A floor is by nature flat and it should appear to stay down. A wall is also flat, hence any covering of paint or paper should form a restful and neutral background for the furnishings and people that appear against it. It is helpful to study the values in nature before determining the values to be used in the interiors of the home. During the greater part of the year the ground is the darkest value, the hills or distant trees are lighter, and the sky is the lightest value. The floor, walls and ceiling should correspond respectively to these values in nature. The floor should be the darkest in value, the walls lighter and the ceiling the lightest of all.

If undue attention is called to the floor or rugs, the very basis of room furnishing is incorrectly begun. Plain rugs of grayed colors are very good, especially if some of the furniture coverings are rich in pattern and texture. With plain furniture or upholstery, figured rugs or two-toned effects are suitable. If the colors of plain rugs are much darker or lighter than neutral gray, they have the disadvantage of showing footmarks and soil more easily than a rug with a pattern. If patterns and colors are used, they should be subdued or inconspicuous enough not to attract undue attention. For rooms of medium size small designs are better. A large pattern, or a large center medallion makes a room appear smaller. A rug with a border design has the same tendency. Several small rugs, well placed, will add apparent size to the room. Naturalistic patterns or designs, showing strong contrasts of light and dark or of color, are not suitable since they do not make a floor appear flat, as its structure indicates that it should. Rugs should be placed with their edges parallel to the sides of the room, and not cat-a-corner.

The treatment of walls and woodwork or trim is very important. Greater background unity is secured when walls and trim, whether stained or painted, are of about the same value and color. Strong contrasts in walls and trim not only break up the background, but call undue attention to themselves and decrease the apparent size of the room. A number of exceptions may be found to this treatment. The English interior with rich paneled walls, beamed ceilings, and decorative window openings, and the Colonial house with its mahogany doors and trim, had strong contrasts in walls and trim. In the English style the structural lines of the room are emphasized.

There are various ways of treating walls. The sand finish of plaster walls forms a good surface for oil paint, since the rough surface adds tone value. Very interesting textures may be secured by varying color tones close in value. A smooth shiny finish should be avoided except on the bathroom and kitchen walls. Muresco is cheaper than paint or wall paper. Wall paper has a soft effect on a smooth finished wall. The wall needs to be sized with cheap varnish in order that the paper may adhere properly. Plain papers, two-toned effects, or all-over delicate pastel tints with little variation in tone are best. Patterns in wall paper should be avoided if any pictures are hung. The colors best for wall papers are the same as those used for painted walls. Our home should be light and cheerful, hence it is safe for us to use tones of cream, putty, buff, warm gray, tan, light yellow, and gray-green. Light colors make a room appear larger. Warm colors appear to bring sunlight into the room. Dark rooms, or north rooms, may be made to appear sunny by using yellow or soft orange in walls or hangings. Dark values of browns, greens, and blues, not only make rooms appear gloomy, but decrease their apparent size and absorb so much light as to increase the cost of lighting.

Pleasing furnishings are not so much a matter of money as of good taste. The use for which a room is intended should govern the selection of its furnishings and to a certain degree its color scheme. Appropriateness is very important. Formal rooms, such as the living room and dining room, should make a general appeal, hence belongings of a personal nature should be confined to private rooms. Photographs and crayon portraits are therefore out of place in a living room.

Scale is another important consideration. Furnishings should be of the proper size and weight for the particular room in question. The heavy mission and large overstuffed pieces of furniture are too heavy for the living room of average size. The huge chandeliers used some time ago over many dining tables were also out of proportion.

The furniture for a room should, in order to secure unity, be selected with every part of the room in mind, and should have the elements of appropriateness, comfort, beauty of line and proportion, and should be durable. If furniture is well chosen today, it will be suitable a hundred years hence. It is better to buy one good piece occasionally if one has the finished room in mind, than to buy an entire set of inferior quality. If it is a matter of having sufficient pieces for actual use, one may buy attractive rush-bottomed kitchen chairs that are good in design, and a simple drop-leaf table, and finish them in a color scheme appropriate for their use. Old-fashioned, or second-hand furniture may be changed in proportion and design by sawing off parts if one is skilful in the use of tools. Imitation carving may be chiseled or planed off, old varnish may be removed, and the wood may be refinished with paint and enamel or stain and wax.

Recently there has been a great revival of period styles, and many fine modern adaptations are being evolved today. Many farm homes discarded their beautiful mahogany furniture such as was used in colonial days and replaced it with the walnut of poor design. Later the machine-made golden oak with its imitation carving was used. Fortunately, the colonial furniture is being appreciated today. Windson

chairs, gate leg tables, and the various styles used in early colonial days, are suitable, if in the proper setting. For the average American home it is perhaps best to use styles of furniture that are simple in line, similar in scale and weight and that look well together rather than furniture of but one style.

A simply furnished home requires simplehangings. There are numerous materials from which to select. Casement cloth, linen, cretonne, unbleached or dyed muslin, satine, poplin, gingham, and pongee are practical. Voile and lawns are used for glass curtains, and are in better taste than curtains of elaborate design. Figured hangings, or over drops, are usually better for plain walls. Decorative or abstract designs are in better taste than are naturalistic patterns. The furniture should not repeat the same pattern as that of the hangings to any great extent, since too much pattern is monotonous and unrestful. Simple designs for hangings are best. Curtains festooned, pleated, frilled or ruffled to a great degree are less effective than those of simple lines. It is the individual touches that add distinction to a room. One fine picture in color is better than a wall full of mediocre prints. A picture should be simply framed and hung low enough so that one may look directly into it. In order to conform to the structural lines of the room, two vertical wires or cords may be used to support the picture. If several pictures are hung in the same room the upper edges or lower edges should be the same distance above the floor.

Standard books and magazines will be found in the home of good taste. A beautiful home within and without will express the personality and taste of the owners. Their love of the finer things of life will be indicated by the furnishings of the home and the kind of music and literature that they enjoy. Their surroundings may be most attractive and yet, if they lack hospitality and courtesy, and fail to use the type and kind of conversation that is worth while, the visitor of taste and refinement feels a distinct disappointment. It is therefore, the owners themselves that are most important in making the farm house a real home.

The Use of Tractors for Snow Removal

By E. R. Wiggins

A SNOWBOUND street or highway is as useless as an impassable mud road. No one questions the economic necessity of paved city streets and improved country roads; but these are of no value during the winter if provision is not made to keep them open. Blizzards that paralyze commerce by halting transportation on the main market, intercity highways and streets, and that make nearly impossible the passage of fire trucks are public disasters.

The experiences of many cities and rural sections show that the tractor with the correct design of snow plow solves this problem. The development of snow removal has been from methods of hard labor with pick and shovel, loading the snow on wagons and trucks, to road graders pulled by horses, trucks, or tractors. The modern method growing from these is that of pushing the snow from the highway by means of either V-shape or blade plows attached to the front end of tractors. In this work the crawler type has been entirely successful because of adequate power for bucking the deepest snow drifts and the certainty of traction on snow, ice, and sleet. The tracks do not cut or injure road surfaces, and these machines are capable of turning in their own length. The ability to work constantly during extreme cold, full protection and operating conveniences for the drive, all enable the tractor to do this work much more efficiently than can possibly be done by any other method.

The plow being pushed ahead of the power makes a path for the tractor to follow. The snow can be pushed to the right or left or straight ahead as desired. As soon as the snow begins to fall, these plow-equipped tractors are sent out over the main highways and kept at work pushing the snow out of the way, saving much valuable time and expense. Under the older hand and shovel methods no effective work could be done until the storm was over. In many sections plows only are being purchased because tractors are already owned by the highway department. Many townships are also purchasing snow plows to be used with tractors that can be secured at a reasonable rental.

The engineer of Dickinson County, Michigan, regarding tractors for snow removal, says: "By the present method the teams are eliminated and with them the trouble and worry occasioned by shortage of work horses and their inability to work during the storms. With the "caterpillar" the driver and his helper start plowing as soon as the storm starts and continue until the storm abates, thus preventing deep drifts from forming.

"Drifts up to four feet and any length can be cleared, without any trouble, by using both the V-plow in front and the 15-foot plow behind, but in drifts of any greater depth the 15-foot plow is unhooked and the tractor with the V-plow attached is sent through the drifts up one side then on the other, and each time the plow is pushed a little farther out, and then the tractor can take the 15-foot plow through.

"We have plowed a distance of about fifty miles in ten hours using a V-plow in front and 15-foot V-plow behind. The cost to plow this distance with the tractor is about $30. With teams and men using a 15-foot V-plow it would take four teams and two men three days to make a round trip at a cost of about $130. The average cost per mile with tractor has been about eighty cents compared to teams at $3.80."

The principles of design in tractor snow-plow construction as used with the "caterpillar" tractor will be mentioned briefly as representing present day practice. The blade plow is supported on two caster wheels bracketed to an adjusting segment. The drive is taken from a cross beam bolted to the drawbar at the rear of the tractor. This cross beam is hitched to the main side members which run forward on each side of the tractor and are bent at the front to form an A-frame. The plow blade is pivoted at the apex and permits adjustment up to fifty degrees on either side. Spring trip blades are hinged to the lower edge of the plow blade and held in position by helical springs. When an obstruction is encountered the relief blade hinges back allowing the plow blade to pass over the object.

The lengths of the blades are twelve, ten, and six feet respectively on the 40, 25, and 15 horsepower tractors. The heights of the blades of these sizes in the order named are 30, 24½, and 24½ inches. The V-shaped or locomotive plow is particularly recommended for the 40 horsepower tractor for use in bucking the deepest drifts. It is made in 42 and 60 inch heights, and in each type the cutting width of the plow is ten feet. The blades are fitted at a 45-degree angle, the weight of the plow being supported on runners which also carry the worm and worm gear elevating mechanism; the latter is being controlled by the hand wheel in the cab.

A. S. A. E. and Related Activities

A. S. A. E. Committees for 1923

FOLLOWING is a list of committees for 1923, as the appointments have been made and accepted to date:

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A. P. Yerkes C. O. Reed

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Committee on Standardization of Courses in Agricultural Engineering
W. J. Gilmore, Chairman

Committee on Agricultural Engineering Extension
H. H. Sunderlin, Chairman

McCrory Given Important Place

S. H. McCRORY, chief of the division of agricultural engineering of the Bureau of Public Roads, U. S. Department of Agriculture, and chairman of the Reclamation Section of the American Society of Agricultural Engineers, is not only to be the Society's representative again this year on the American Engineering Council, the executive body of the Federated American Engineering Societies, but he has also been given a prominent place in that connection. It is a matter of no small importance and significance to this Society, and likewise a recognition of Mr. McCrory's ability, that he was appointed a member of the executive board of the American Engineering Council for this year. In addition at the annual meeting of the Federation he was elected chairman of the Finance Committee, which appointment also gives him membership on the Committee on Procedure. This appointment is an important one, to say the least, and one which Mr. McCrory is particularly well qualified to fill.

Recommendations for Manger Form and Litter Carrier Standards

THE recommendations that follow for standardized manger forms and litter carriers are based upon the findings of the Committee on Farm Buildings Equipment of the American Society of Agricultural Engineers in its thorough investigation of 1917-1919 and reported at the thirteenth and fourteenth annual meetings of the Society, December 1918 and December 1919. The recommendations were submitted by the Committee on Farm Buildings Equipment to the Standards Committee, and they have been approved by the Standards Committee and will be submitted by a letter ballot to the voting membership of the Society.

In submitting the recommendations to the Standards Committee, the Committee on Farm Buildings Equipment makes the following observations:

"There has been and still is, to a certain extent, a wide variation in sizes and types of mangers put out by different manufacturers of barn equipment. It is believed that the four sizes recommended meet the requirements of the average dairy barn. These sizes give definite measurements for construction and eliminate the confusion likely to result from the use of numerous forms. At the same time they permit sufficient variation to meet the individual needs of almost every dairyman. The adoption and universal use of the proposed manger forms would avoid mistakes in sending wrong templets which cause delays and misunderstandings. With one set of templets the builder is able to make a manger suitable for the requirements of the dairyman and, consequently, use better forms, do better work, and reduce costs. The standard forms recommended have also been recommended by the United States Department of Agriculture, which published the recommended forms in the Weekly News Letter of February 5, 1919."

The specifications for standard manger forms as recommended by the Committee on Farm Buildings Equipment are as follows:

1. Manger A, shown in the drawing, is recommended as standard practice for all new dairy barns. In remodeling an old barn one of the other sizes may be selected.

2. Manger D shows the basic curve from which all the others are formed. The relation of these mangers is shown in Fig. A.

3. The line E-F is straight. It is not tangent to the circle, but intersects it at points E and G. The center of the circle which forms the bottom of the manger is found by using the point E located six inches above the base line and twenty inches from the curb, as a center, and with a radius of eighteen inches describing an arc intersecting a vertical line drawn seven inches from the inner face of the curve. With this point of intersection as a new center and with said radius describe an arc of the circle passing through the point E, thus forming the bottom of the manger.

The Committee on Farm Buildings Equipment in making recommendations for standard litter carrier sizes to the Standards Committee makes the following observations:

"A careful investigation of the method of rating litter carriers shows the necessity for eliminating the confusion arising from the many different methods of rating. One uniform method of rating is proposed, which can be used without hardship to manufacturers and will be of great advantage to prospective purchasers. These recommendations are on the basis of conserving materials and rendering a better service to the farmer.

The recommendations for standard litter carrier sizes and capacities are as follows:

1. In estimating the capacity of litter carriers the levelful measure is considered standard.

2. The size number should be stamped on all litter carriers, and dimensions and clearances should be given in all catalogs and other printed literature: (a) clearance with box upright; (b) clearance with box dumped.

3. The capacities of various sizes of litter carriers are to be designated as follows:

CAPACITY

Size	Minimum	Maximum
No. 2	8,000 cu. in.	8,600 cu. in.
No. 3	12,000 cu. in.	12,900 cu. in.
No. 4	16,000 cu. in.	17,200 cu. in.
No. 5	20,000 cu. in.	21,500 cu. in.
No. 6	24,000 cu. in.	25,800 cu. in.
No. 7	28,000 cu. in.	30,100 cu. in.

The variation of capacity from size to size is constant. This is very convenient in that size number multiplied by the factor 4,000 gives the rated capacity in cubic inches and twice the size number gives approximate capacity in bushels. This rule should be stated in catalogs for the convenience of customers. The range of maximum and minimum capacities allows a tolerance of 7½ per cent, which should be sufficient to take care of manufacturing details.

4. The following inside dimensions of the tub for the various sizes give a most economical use of materials and permit the use of a standard sheet:

Size	Width	Depth	Length
No. 2	22 inches	13 inches	36 inches
No. 3	24 inches	16 inches	38 inches
No. 4	26 inches	19 inches	40 inches
No. 5	26 inches	21½ inches	42 inches
No. 6	28 inches	24 inches	42 inches
No. 7	28 inches	24 inches	48 inches

5. It is not recommended that all manufacturers make all sizes, but sizes selected by any manufacturer should conform to the above specifications.

6. The manufacturers of litter carriers should put into effect the foregoing recommendations not later than January 1, 1924.

Recommended A. S. A. E. Tractor Testing and Rating Code

The Committee on Tractor Testing and Rating of the American Society of Agricultural Engineers has submitted the following as the recommended A. S. A. E. Tractor Testing and Rating Code, to the Standards Committee for approval. Following approval by the Standards Committee, it will be submitted to letter ballot of the Society:

I. Tractor Rating Specifications

1. *Belt Rating*. The belt horsepower rating of the trac-

tor shall not exceed 80 per cent of the maximum load which the engine will maintain by belt at the brake or dynamometer for two hours at rated speed, the test to be carried out as specified by the testing code.

2. *Drawbar Rating.* The drawbar rating of the tractor shall not exceed 80 per cent of the maximum drawbar horsepower developed (in same gear as rated drawbar load) in the official tests conducted by the University of Nebraska.

II. Testing Code Rules and Regulations

1. *Nature of Tests.* The following tests are to be conducted on three or more tractors picked at random from factory stock run by the engineers conducting the test. The average of all tests completed is to be used in determining the results. Should any tractor start on the test and be taken off before the test is completed, a statement to this effect with reasons for withdrawal shall be included in the report. Records of fuel consumption are to be taken during all tests except Test A. (The fuel consumption record does not enter into the question of rating but is for comparison only.)

Test A. Limbering-up Run. The tractor or tractors to be tested shall be submitted to a "limbering-up" run on the drawbar of twelve or more hours, the length of time of this run to be stated in the report. Drawbar loads of approximately one-third, two-thirds, and full load shall be pulled by the tractor during the run, each load being pulled for approximately an equal length of time, the lighter loads being used first.

Test B. Maximum Brake Horspower Test. The engine is to be tested in the belt with the governor set to give full opening of governor valve, and the carburetor set to give maximum power at rated speed. (The rated speed is that which the manufacturer recommends for the engine under load). The test shall begin after the temperature of the cooling fluid and other temperature conditions have become practically constant. The duration of this test shall be two hours of continuous running with no change in load[1] or engine adjustments. If the speed should change during the test enough to indicate that conditions had not become constant when the test was started, the test will be repeated with the necessary change in load.

Test C. Rated Brake Horsepower Test. The engine is to be tested in the belt at rated speed. The load is to be such as to give 80 per cent of the horsepower obtained in Test B. The test shall begin after the temperature of the cooling fluid has become constant and shall continue for two hours continuous running with no change in load or engine adjustment.

Test D. Varying Load Tests. The engine is to be tested in the belt with all adjustments as in Test C with no stops. The total running time shall be one hour and ten minutes, divided into seven ten-minute intervals as follows:

(a) 10 minutes at load as in Test C.
(b) 10 minutes at maximum load.
(c) 10 minutes at no load.
(d) 10 minutes at one-fourth load.
(e) 10 minutes at one-half load.
(f) 10 minutes at three-fourths load.
(g) 10 minutes surging loads varying suddenly from maximum load to no load and other varying loads between these extremes.

The object of this test is to determine the efficiency of governor action or speed control and to determine fuel consumption at different loads. If the load changes, make readjustments necessary; the final report of the test will state that such was the case.

2. *Method of Testing.* The tests stated are to be conducted by at least three, and not more than five disinterested engineers, to be known as the Testing Board. These engineers shall be selected from those having full membership in any of the following societies: American Society of Agricultural Engineers, Society of Automotive Engineers, American Society of Mechanical Engineers, or from the engineering staffs of state agricultural or engineering colleges and universities. The personnel of this board must be approved by the chairman of the Farm Power and Equipment Section and the chairman of the Committee on Tractor Testing and Rating of the American Society of Agricultural Engineers. This board is responsible to the chairman of the Farm Power and Equipment Section of the American Society of Agricultural Engineers.

The manufacturer shall choose one member of the Testing Board; the chairman of the A. S. A. E. Farm Power and Equipment Section shall choose another member, preferably from the membership of the Committee on Tractor Testing and Rating, and the two thus chosen shall choose a third member. In case it is desired to have five members on this board the three members chosen as above shall choose two additional members. The Board shall choose one of its members as a chairman who shall be the spokesman for the board and shall direct the work of testing in a general way.

Manufacturers' requests for the carrying out of tests shall be made to the chairman of the Farm Power and Equipment Section of the American Society of Agricultural Engineers.

3. *Manufacturers' Representatives and Tractor Operators.* The manufacturer shall have one representative present during the test whom he shall designate as his official representative with authority to act. The manufacturer will be required to furnish operators during the entire series of tests. During the test the operator shall be under the direction of the Testing Board. The engineers of the Testing Board are to act in a supervisory capacity and to take all readings and compile results.

4. *Where Tests may be Conducted.* These tests may be conducted at any place which meets the approval of both the manufacturer and the engineers who are to conduct the tests.

5. *Belt Horsepower Tests.* All belt horsepower tests must be made with an electric dynamometer, or with an accurately tested Prony brake, or other power-measuring device approved by the Testing Board.

6. *Fuels.* All tests will be made on the lowest commercially available grade of fuel which the manufacturer recommends for his particular tractor. All fuels used shall be purchased on the open market and shall consist of the low grades of such fuel commonly sold in the locality, i. e., if the tractor is to operate on gasoline the lowest grade of such fuel commonly sold in the community shall be used. The same is true of kerosene and distillate. All fuels shall be tested by the Testing Board or under its supervision.

The quantity of fuel used in each part of the test shall be determined by weight and reduced to the United States standard gallon at 60 degrees Fahrenheit. For the brake tests a fuel tank shall be placed on a scale and set at the same height as the fuel tank on the tractor. All fuel used during the test shall be drawn from this tank and weighing made and recorded at regular intervals not more than ten minutes apart during the test.

7. *Lubricants.* Manufacturers must specify the kinds and grades of lubricants to be used in the different parts of the tractor.

The quantity of oil used is to be determined by the United States standard gallon, quart or pint measure. The height of the oil level shall be noted at the start of the test. At the end of the test enough oil shall be added to bring the height of oil back to the original level, measuring the oil so

[1] The term "load" as used in this code, in connection with brake tests, means pounds on dynamometer or brake scale.

added. If the oil level should rise during the test enough oil shall be drained to bring to the original level, measuring the oil so drained and recording in the report.

8. *Water.* The quantity of water used in the radiator and cooling system is to be determined by measuring the height of the water at the beginning of the test and filling to the same level at the end of the test, weighing or measuring the water added. If necessary in order to secure accurate results, the water added, will be heated to the same temperature as the water in the radiator or tank.

Where possible the quantity of water used in the carburetor will be determined by weight by the same method as the weight of the fuel is obtained.

Important Hearing on Jurisdiction of Metal Trims

AN IMPORTANT hearing of the National Board for Jurisdictional Awards having to do with the consideration of the question as to the jurisdiction of metal trims is to be held in Washington, Monday, February 19, at 10:00 A. M. This hearing is called as the result of a great deal of contention over whether the carpenters' union or the metal trades' union has jurisdiction over hanging metal doors, windows, etc. Some months ago the National Board for Jurisdictional Awards rendered a decision in favor of the metal workers, which led to the withdrawal of the carpenters' union from the building trades department of the American Federation of Labor. The entire subject has been a matter of much debate and controversy, manufacturers and contractors having disagreed as well as labor. For that reason it is very important that all concerned should bear in mind the hearing to be held on February 19.

At this hearing the National Board for Jurisdictional Awards invites all interested parties to be present prepared to offer such evidence and testimony and exhibits as may be necessary or advisable, which is especially urged in a resolution passed by the Board urging all interested to attend the hearing and present such testimony as they desire. Members of the A. S. A. E. who are interested in the matter under consideration, and who can conveniently arrange to do so, should by all means attend the hearing. A. S. A. E. members who are unable to be present at this hearing, but who have testimony or suggestions to present, should place such matter in the hands of S. H. McCrory, division of agricultural engineering, U. S. Department of Agriculture, Washington, who will be glad to represent the Society or any of its members at the hearing.

National Museum of Engineering and Industry

A JOINT committee on a National Museum of Engineering and Industry has been formed by the four founder societies of the Federated American Engineering Societies for the purpose of formulating a plan for a national museum of engineering and industry, which will consist of a central institution with branches in different sections of the country as necessity requires. This committee is actively at work and desires to have all engineers interested in this movement, communicate with the committee concerning any constructive suggestions which may occur to them, so that such suggestions may be incorporated in a plan, to the end that such a museum may be evolved as will be fit to grace the greatest industrial nation of the world. Each member of the American Society of Agricultural Engineers who has any constructive thought in relation to the matter is requested to write directly to H. F. J. Porter, chairman of the committee, 29 West Thirty-ninth Street, New York City.

Review of Industrial Standardization

THE YEAR 1922 has seen greater activity in industrial standardization than any other year in the history of American industry. Notable progress was made during the year in standardization of raw materials, of manufacturing processes, and of finished products by individual firms, by industrial and technical associations and by bodies that are working on national and international lines.

One of the most far-reaching accomplishments of the year was the organization, on a working basis, of the Federal Specifications Board which develops and approves the specifications under which all government purchases are made, and the development of a plan of cooperation between this Board and the American Engineering Standards Committee; the carrying out of this plan should go far toward eliminating the difference between specifications for government purchases and specifications for ordinary commercial supplies and should thereby result in the saving of millions of dollars both for the government and for industry.

The organization of Secretary Hoover's Division of Simplified Practice and its entrance into industrial field has had a highly stimulating effect on the industrial standardization movement and has helped in particular to press home to the business man that standardization is one of the main approaches to efficiency and the elimination of waste. The Division of Simplified Practice has already brought about standardization of paving brick, of beds, mattresses and springs, and of metal lath. It now has under way the standardization of lumber and other products. The distinction between the basis for this work and that of the American Engineering Standards Committee lies in the fact that the Division of Simplified Practice devotes itself particularly to that part of the field in which the decisions must be made on a non-technical basis.

Great advances have been made by industry itself on the more technical side. More than 120 standardization undertakings now have an official status before the American Engineering Standards Committee, 43 of them having been initiated within the last year; this is an increase of more than 50 per cent. Of the 28 industrial standards developed and approved by the American Engineering Standards Committee since its organization in 1918, thirteen were approved within the past year. The efforts to develop national safety codes, which have been under way for a number of years, began for the first time to bear fruit.

News of the Student Branches

University of Nebraska

L. C. HAIGHT and Edgar Nichols, members of the Nebraska Student Branch of the American Society of Agricultural Engineers, were recently awarded first and second prizes respectively in a literary contest held by that organization. The prizes consisted of a tool chest and set of tools made by students in the agricultural engineering department. Mr. Haight won the chest and Mr. Nichols the tools.

Topics were assigned to members of the Student Branch who prepared papers on them and presented the papers at branch meetings. The contestants were judged sixty per cent on quality of material, twenty per cent on presentation, and twenty per cent on other means lending effectiveness. The idea was started on the initiative of the student branch members and the contest received encouragement and aid of the faculty. It was considerable of an innovation at the University and showed the deep interest which members are taking in their work. Much of the credit for the success of

the contest is given by members to Prof. C. W. Smith of the agricultural-engineering staff.

Mr. Haight's paper was "Making Ice on the Farm," while Mr. Nichols spoke on "Keeping the Farm Plant Fit."

This contest proved a fertile source of enjoyment and profit to members of the student branch, and it offers an excellent suggestion to other student branches of the Society.

Personals

JOHN S. GLENN, assistant agricultural engineer at Virginia Polytechnic Institute, writes that during September the department of agricultural engineering of the Virginia Polytechnic Institute, in cooperation with the division of agricultural engineering of the U. S. Department of Agriculture, made a power survey of three typical farm streams in three different counties in southwest Virginia to locate all possible power sites and determine the available power for use in the farm home. A cooperative bulletin is now being prepared which will give recommendations in regard to the equipment and the approximate cost of each site in addition to other information relative to the power development of small farm streams.

JAMES A. KING, director of publicity and advertising of the Mason City Brick & Tile Company, Mason City, Iowa, beginning with the October 1922, issue of The National Reclamation Magazine, took over the editoral work of that publication.

New A. S. A. E. Members

EARL A. BICKEL, 10 Interocean Building, Cedar Rapids, Iowa. (Associate).

THOMAS D. CAMPBELL, Hardin, Montana. (Member).

F. D. CORNELL, JR., Department of Agricultural Engineering, University of West Virginia, Morgantown, Virginia. (Associate).

H. M. PARSONS, manager and consulting engineer, Central Massachusetts Electric Company, Palmer, Massachusetts. (Member).

Applicants for Membership

The following is a list of applicants for membership received since the publication of the January issue of AGRICULTURAL ENGINEERING. Members of the Society are urged to send pertinent information relative to the applicants for the consideration of the Council prior to election.

C. C. Knight, Lavras, E. de Minas, Brazil.

Walter S. Packard, Delhi, California.

W. W. Schuyler, United Fruit Company, Guaro, Oriente, Cuba.

F. E. Staebner, Bureau of Public Roads, Washington, D. C.

W. K. Winterhalter, 1409 Alexander Building, San Francisco, California.

EMPLOYMENT SERVICE

This service, conducted by the American Society of Agricultural Engineers, appears regularly in each issue of AGRICULTURAL ENGINEERING. Members of the Society in good standing will be listed in the published notices of the "Men Available" section. Non-members, as well as members, are privileged to use the "Positions Available" section. Copy for notices should be in the Secretary's hands by the 20th of the month preceding date of issue. The form of notice should be such that the initial words indicate the classification. No charge will be made for this service.

The Secretary receives at frequent intervals bulletins from the Engineering Societies' Service Bureau, 29 West 39th Street, New York City, listing the "positions open" as reported by member societies. Copies of these bulletins are sent to the "men available" listed below, as soon as received.

Men Available

MECHANICAL AND ELECTRICAL ENGINEER, graduate of Cornell University and Armour Institute, with nineteen years of practical experience in designing, manufacturing, and marketing gasoline engines, automobiles, motor trucks and tractors, having specialized particularly on internal-combustion motors and their application, prefers mechanical work cooperating with the different manufacturing and sales departments along the lines of sales engineering, or other work into which his qualifications would fit. MA-101

AGRICULTURAL ENGINEER wants position in southwest. Graduate of University of Illinois 1915, five years practical experience on Illinois farm with power equipment, two years in charge of the agricultural engineering department New Mexico College of Agriculture; considerable garage experience and service experience on unit power and light plants. Also one summer in Philadelphia battery service station. MA-106

AGRICULTURAL ENGINEER, graduate in mechanical engineering at Michigan Agricultural College, desires position teaching all kinds of farm machinery or automotive work, or with some farm-equipment manufacturer. Will be available April 1, 1922. Has served one year as instructor in tractors and trucks, and one year conducting service schools for a leading tractor manufacturer. Can furnish best of references. MA-110

AGRICULTURAL ENGINEER, graduating from University of Missouri at the end of present semester (available January 1, 1923), would like position teaching agricultural engineering work or with some company manufacturing farm equipment. Age 23. Unmarried. MA-115

AGRICULTURAL ENGINEER, graduating from University of Illinois at end of present semester (available March 1, 1923) would like position in service department or experimental department of company manufacturing tractors or farm machinery. Three years' practical farm experience in West and one year in Illinois. Age 27. Unmarried. MA-116.

Positions Open

DRAFTSMAN who has had experience in designing and manufacturing threshing machinery with reliable, well-established farm-machinery manufacturer in central Pennsylvania. PO-1.

DRAFTSMAN to assist in designing threshing machinery and gas tractors with well-established manufacturer of farm machinery in the East. PO-2.

STUDENT FELLOWS OR INSTRUCTOR IN DRAINAGE. The department of soils of the Oregon State Agricultural College will be able to use two student fellows, one in pure soils and one in soil irrigation and drainage work, if they can be promptly located, or an instructor in drainage if fellows are now secured. Write W. L. Powers, chief in soils, Corvallis, Oregon. PO-3.

STUDENT FELLOW IN AGRICULTURAL ENGINEERING. There will be an opening beginning September, 1923, for a student fellow in agricultural engineering at the Virginia Polytechnic Institute. Write Charles E. Seitz, department of agricultural engineering, Virginia Polytechnic Institute, Blacksburg, Virginia. PO-4.